

Claims

[1] A gas turbine protection apparatus which measures blade pass temperatures of combustion gases of a plurality of combustors arranged toroidally by temperature sensors at least equal in number to the number of the combustors and arranged toroidally at turbine blade outlets, and which outputs a gas turbine protection signal based on the blade pass temperature measured values of the temperature sensors, and comprising:

a temperature deviation computing section for computing a difference between an average value of the blade pass temperature measured values and the blade pass temperature measured value of each temperature sensor to find a blade pass temperature deviation of each temperature sensor;

a temperature deviation change amount computing section for computing a blade pass temperature deviation change amount of each temperature sensor based on the blade pass temperature deviation of each temperature sensor computed by the temperature deviation computing section;

a temperature deviation change amount large determining section for comparing the blade pass temperature deviation change amount of each temperature sensor computed by the temperature deviation change

amount computing section with a blade pass temperature deviation change amount large set value to output a blade pass temperature deviation change amount large signal when the blade pass temperature deviation change amount of each temperature sensor exceeds the blade pass temperature deviation change amount large set value;

a temperature deviation change amount present determining section for comparing the blade pass temperature deviation change amount of each temperature sensor computed by the temperature deviation change amount computing section with a blade pass temperature deviation change amount present set value smaller than the blade pass temperature deviation change amount large set value to output a blade pass temperature deviation change amount present signal when the blade pass temperature deviation change amount of each temperature sensor exceeds the blade pass temperature deviation change amount present set value; and

a protection signal outputting section for outputting the gas turbine protection signal when the blade pass temperature deviation change amount of any of the temperature sensors exceeds the blade pass temperature deviation change amount large set value, and the blade pass temperature deviation change amount large signal is outputted from the temperature deviation change amount large determining section, and

when the blade pass temperature deviation change amount of any of the temperature sensors adjacent bilaterally to the any temperature sensor exceeds the blade pass temperature deviation change amount present set value, and the blade pass temperature deviation change amount present signal is outputted from the temperature deviation change amount present determining section.

[2] The gas turbine protection apparatus according to claim 1, characterized in that

the protection signal outputting section includes

a first off-delay timer section for delaying a time when the blade pass temperature deviation change amount large signal outputted from the temperature deviation change amount large determining section becomes OFF, and

a second off-delay timer section for delaying a time when the blade pass temperature deviation change amount present signal outputted from the temperature deviation change amount present determining section becomes OFF.

[3] The gas turbine protection apparatus according to claim 1 or 2, characterized in that

the protection signal outputting section also outputs the gas turbine protection signal when the blade

pass temperature deviation change amount of any of the temperature sensors exceeds the blade pass temperature deviation change amount large set value, and the blade pass temperature deviation change amount large signal is outputted from the temperature deviation change amount large determining section, and when any of the temperature sensors adjacent bilaterally to the any temperature sensor has a value out of range.

[4] A gas turbine protection apparatus which measures blade pass temperatures of combustion gases of a plurality of combustors arranged toroidally by temperature sensors at least equal in number to the number of the combustors and arranged toroidally at turbine blade outlets, and which outputs a gas turbine protection signal based on the blade pass temperature measured values of the temperature sensors, and comprising:

a temperature deviation computing section for computing a difference between an average value of the blade pass temperature measured values and the blade pass temperature measured value of each temperature sensor to find a blade pass temperature deviation of each temperature sensor;

a temperature deviation great determining section for comparing the blade pass temperature deviation of each temperature sensor computed by the

temperature deviation computing section with a blade pass temperature deviation great set value to output a blade pass temperature deviation great signal when the blade pass temperature deviation of each temperature sensor exceeds the blade pass temperature deviation great set value;

a temperature deviation present determining section for comparing the blade pass temperature deviation of each temperature sensor computed by the temperature deviation computing section with a blade pass temperature deviation present set value smaller than the blade pass temperature deviation great set value to output a blade pass temperature deviation present signal when the blade pass temperature deviation of each temperature sensor exceeds the blade pass temperature deviation present set value; and

a protection signal outputting section for outputting the gas turbine protection signal when the blade pass temperature deviation of any of the temperature sensors exceeds the blade pass temperature deviation great set value, and the blade pass temperature deviation great signal is outputted from the temperature deviation great determining section, and when the blade pass temperature deviation of any of the temperature sensors adjacent bilaterally to the any temperature sensor exceeds the blade pass temperature deviation present set value, and the blade

pass temperature deviation present signal is outputted from the temperature deviation present determining section.

[5] The gas turbine protection apparatus according to claim 4, further comprising

a temperature deviation change amount computing section for computing a blade pass temperature deviation change amount of each temperature sensor based on the blade pass temperature deviation computed by the temperature deviation computing section, and

a temperature deviation change amount present determining section for comparing the blade pass temperature deviation change amount of each temperature sensor computed by the temperature deviation change amount computing section with a blade pass temperature deviation change amount present set value to output a blade pass temperature deviation change amount present signal when the blade pass temperature deviation change amount of each temperature sensor exceeds the blade pass temperature deviation change amount present set value, and

characterized in that the protection signal outputting section also outputs the gas turbine protection signal when the blade pass temperature deviation of any of the temperature sensors exceeds the blade pass temperature deviation great set value,

and the blade pass temperature deviation great signal is outputted from the temperature deviation great determining section, and when the blade pass temperature deviation change amount of any of the temperature sensors adjacent bilaterally to the any temperature sensor exceeds the blade pass temperature deviation change amount present set value, and the blade pass temperature deviation change amount present signal is outputted from the temperature deviation change amount present determining section.

[6] The gas turbine protection apparatus according to claim 4 or 5, characterized in that

the protection signal outputting section includes an off-delay timer section for delaying a time when the blade pass temperature deviation change amount present signal outputted from the temperature deviation change amount present determining section becomes OFF.

[7] The gas turbine protection apparatus according to claim 4, 5 or 6, characterized in that

the protection signal outputting section also outputs the gas turbine protection signal when the blade pass temperature deviation of any of the temperature sensors exceeds the blade pass temperature deviation great set value, and the blade pass temperature deviation great signal is outputted from the

temperature deviation great determining section, and when any of the temperature sensors adjacent bilaterally to the any temperature sensor has a value out of range.